

WHAT IS CLAIMED:

1. A medical implant for the controllable delivery of at least one pharmaceutical compound to a localized area within a patient, said implant comprising:

an implantable medical device having a surface and a coating formed on at least a portion of said surface, said coating having at least two layers, at least one of said layers incorporating at least one releasable pharmaceutical compound, each of said layers having at least one physical property affecting the releasability of said releasable pharmaceutical compound that differs from said at least one other layer.

2. The medical implant of claim 1 wherein said medical device is selected from the group consisting of stents, probes, catheters, micro-particles, pacing leads, vascular grafts, access devices, in-dwelling access ports, valves, plates, barriers, supports, shunts, discs, and joints.

3. The medical implant of claim 2 wherein said stent is selected from the group consisting of vascular stents, biliary stents, and esophageal stents.

4. The medical implant of claim 1 wherein said at least one layer is a polymer.

5. The medical implant of claim 4 wherein said at least one physical property affecting the releasability of said at least one pharmaceutical compound is molecular weight.

6. The medical implant of claim 5 wherein said molecular weight range from about 1 kDa to 100,000 kDa.

7. The medical implant of claim 4 wherein said polymer is selected from the group consisting of poly(caprolactone), poly(lactic acid), poly(glycolic acid), poly(ethylene-vinyl acetate), collagen, heparinized collagen, polyvinyl pyrrolidone, polytetrafluoroethylene, polyethylene glycol, polystyrene, acrylates, polyesters, epoxides, silicones, cellulose, and copolymers thereof.

8. The medical implant of claim 1 wherein said at least one pharmaceutical compound is an anti-restenotic drug.

9. The medical implant of claim 8 wherein said anti-restenotic compound is a macrolide antibiotic.

10. The medical implant of claim 9 wherein the macrolide antibiotic is rapamycin or analogues and derivatives thereof.
11. A method for controllably delivering at least one pharmaceutical compound to a localized area within a patient, said method comprising the steps of:
providing a controllable drug releasing gradient coating on an implantable medical device; and
implanting said medical device at a specific target site within a patient.
12. A method for making a controllable drug releasing gradient coating for the surface of a medical device, said method comprising the steps of:
forming a first layer on said surface of said medical device, said first layer containing at least one releasably bound pharmaceutical compound and having at least one physical property affecting the releasability of said at least one pharmaceutical compound; and
forming at least one additional layer on said first layer, said at least one additional layer differing in said at least one physical property.
13. The method of claim 12 wherein said generally tubular structure is a stent or a catheter.
14. The method of claim 13 wherein said stent is self-expanding.
15. The method of claim 13 wherein said stent is mechanically expandable.
16. The method of claim 13 wherein said stent is bioresorbable.
17. The method of claim 12 wherein each polymer layer of said at least one polymer layer is comprised of polymers having different molecular weights.
18. The method of claim 17 wherein said molecular weights range from about 1 kDa to 100,000 kDa.
19. The method of claim 12 wherein said polymer layers are selected from the group consisting of poly(caprolactone), poly(lactic acid), poly(glycolic acid), poly(ethylene-vinyl acetate), collagen, heparinized collagen, polyvinyl pyrrolidone, polytetrafluoroethylene, polyethylene glycol, polystyrene, acrylates, polyesters, epoxides, silicones, cellulose, and copolymers thereof.
20. The method of claim 17 wherein said at least one anti-restenotic compound is contained within adjacent polymer coatings.
21. The method of claim 20 wherein said anti-restenotic compound is a macrolide antibiotic.

22. The method of claim 21 wherein the macrolide antibiotic is rapamycin or analogues and derivatives thereof.

23. The method of claim 17 wherein said at least one anti-restenotic compound is coupled to said polymer coating.

24. The method of claim 23 wherein said anti-restenotic compound is a macrolide antibiotic.

25. The method of claim 24 wherein the macrolide antibiotic is rapamycin or analogues and derivatives thereof.